Building Connections in the Sand

Here's how one of the largest producers of industrial sand developed an industrial Ethernet redundancy ring to control its mining facility

Ohio's Fairmount Minerals is one of the largest producers of industrial sand in the U.S., and its Illinois-based subsidiary, Wedron Silica, has been hard at work for more than a century. The sand is mined from the St. Peters Sandstone, which is a 200 million-year-old sand deposit that runs from Minnesota to Oklahoma. Recently, Wedron Silica chose high-security Lynx switches engineered for harsh industrial environments to develop a full industrial Ethernet redundancy ring to monitor and control its entire mining facility. Lynx switches are manufactured by Westermo, an industrial data communications leader headquartered in Sweden. The company says the switches have a 20-ms reconfiguration time &#151 considered the best off-the-shelf performance of Ethernet switches.

Wedron Silica produces high-purity round-grain silica sand.

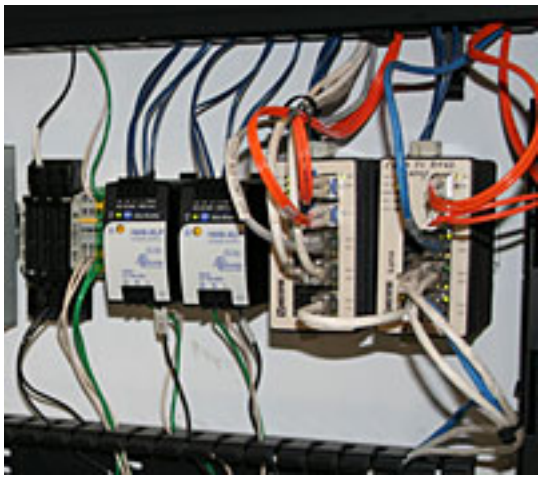
More than 50 hourly and 10 supervisory personnel manage the production of approximately 10,000 tons of sand each day. The Wedron facility's top producing segment is for the fracturing sand market. Hydraulic fracturing sands, known as frac sands, consist almost entirely of quartz or silica sands and are used as proppants in oil and gas wells. Frac sand treatment forces a concoction of frac sands, viscous gel, and other chemicals down a well to prop open fractures in the subsurface rocks, thus creating a passageway for fluid from the reservoir to the well.

The Wedron Silica plant operates 24 hours a day, seven days a week. All production is managed through its industrial Ethernet network. This network exchanges data from hydraulic high-pressure mining canons. Additionally, data from cameras linked to the control center via fiber-optics help to control and adjust truck loading as well as the sand drying rooms. The data monitoring and control systems need to have the highest reliability levels, specifically in such a harsh industrial environment as mining.

High-security Lynx switches are engineered for harsh industrial environments.

"Our data network has been working using the Ethernet protocol for 10 years, but this is the first time that we have installed a full redundancy ring," said Frank Barnes, technical manager at Wedron Silica. He listed several reasons for choosing Lynx switches: its strong harsh environment compliancy, its off-the-shelf redundant ring capability, and its fast data recovery time. "Particularly, we appreciate the easy configuration and monitoring of the switches as well as the no-charge software updates," he added. "We have also had very close technical collaborations with Trond Grendar from Westermo and Doug Smith of the John R. Willis Co., an independent manufacturer's representative for Gross Automation, Westermo's distributor in North America."

The ring portion of the network consists of 11 Lynx 1400 Series switches with six Lynx 400 Series switches on branch runs. The ring switches are located in the plant process buildings and are named for their location. All are mounted in dust-tight boxes and powered by two 24 VDC power supplies connected to a battery backup. The ring network is kept powered for more than two hours in the event of a power outage. All the control and monitoring information is passed on Westermo's network.



Lynx switches have no moving parts or electrolytic capacitors.

Westermo's L1400 and L400 support IMGP protocol (Internet Group Management Protocol) provides filtering techniques to control the flow of data around the ring in such a way as to optimize the bandwidth as well as to secure the network operation. IGMP is used by IP hosts to dynamically register membership in Multicast groups to the closest multicast router. Multicast routers periodically send out a "Host Membership Query" message to remain updated on group membership for the local network. Multicasting is selected to use bandwidth efficiently and cut down on traffic. When data needs to be sent to a large number of users on the network,

the data is sent simultaneously to the specified users via multicasting &#151 not blanketed to all users. IGMP snooping requires the switch to examine, or snoop, some Layer 3 information in the IGMP packets sent between the hosts and the router. When the switch hears the IGMP host report from a host for a particular multicast group, the switch adds the host's port number to the associated multicast table entry. When the switch hears the IGMP leave a group message from a host, it removes the host's port from the table entry. The Lynx Series has the IGMP Server (router) implemented, which means that no external IGMP server on the network is necessary. It is also integrated with a FRNT feature, which means that the multicast filters will be updated within 20 ms in case of any network failure.
The Lynx switches support QoS (Quality of Service) with four priority queues and strict priority scheduling as well as HoL (Head of Line Blocking Prevention). This is also a key issue for process applications such as Wedron's implementation because it achieves determinism for real-time critical applications.
The 1400 and 400 Series switches have a military design with full-metal IP 40 housing. They operate under a wide temperature range from -40&#176 to +158&#176F and have a wide DC power range from 19 to 60 VDC. In addition, they have no moving parts or electrolytic capacitors, boast low power consumption with redundancy, and are DIN rail-mounted.

More information about Westermo's Lynx switches is available from Gross Automation, 1725 S. Johnson Rd., New Berlin, WI 53146, calling 262-446-0000, or visiting www.grossautomation.com or www.westermosales.com.

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